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Public Distribution System Reforms and Consumption in Chhattisgarh

A Comparative Empirical Analysis

PRASAD KRISHNAMURTHY, VIKRAM PATHANIA, SHARAD TANDON

Chhattisgarh's public distribution system reforms have been lauded as a model for the National Food Security Act, and as one that other states can emulate. Previous research has shown that PDS rice consumption increased in Chhattisgarh following reforms by the Raman Singh government, which began in 2004. However, one-third of PDS rice consumption growth in Chhattisgarh took place before 2004. This finding suggests that the pre-2004 reforms to fair price shop ownership and state procurement by the Ajit Jogi government contributed to PDS consumption growth. Our findings suggest that sustained reforms, when coupled with political and social will, can improve PDS access, and that improvements may not be substantial or sustained in the absence of these factors.

PDS Reforms: An Introduction

The National Food Security Act (NFSA) instantiates the present government's commitment to expanding and possibly improving the public distribution system (PDS). The NFSA will dramatically increase the number of households eligible for PDS foodgrain rations. It also recommends a series of PDS reforms, including preferences for community organisations in administering fair price shops (FPSs), doorstep delivery of foodgrain, and public availability and computerisation of records.

Over the past decade, several states have attempted to increase PDS consumption by implementing similar reforms (Khera 2011a, 2011b). An empirical account of state-level reforms is therefore valuable for assessing the likely effects of the NFSA. Chhattisgarh's experience makes it an especially salient case study. Beginning in 2004, the Raman Singh government introduced a series of major reforms to the delivery and procurement of PDS foodgrain. These include transferring FPSs to local bodies, providing below-poverty-line (BPL) rations to more households, and reducing the PDS ration price.¹

The Raman Singh government's PDS reforms have been lauded as a model for the NFSA, and as one that other states can emulate (see, for example, *The Economist* 2012). Haryana and Punjab implemented pilot programmes based on Chhattisgarh's model (*The Economic Times* 2010). The Supreme Court demanded to know why Chhattisgarh could not serve as a model for the rest of the country (*The Times of India* 2013a). Following suit, the Bharatiya Janata Party (BJP) called on the Congress to make the NFSA more like the Chhattisgarh Food Security Act by increasing coverage, rations, and subsidies (*The Times of India* 2013b).

In this article, we analyse the effect of PDS reforms in Chhattisgarh on PDS rice consumption from 1999-2000 to 2009-2010 by using districts that border Chhattisgarh, states that border Chhattisgarh, and the rest of India as comparison groups. Although prior studies have found an increase in PDS availability in Chhattisgarh (Khera 2011a, 2011b; Puri 2012), Chhattisgarh's reforms have not been analysed relative to a plausible counterfactual. Such a comparison is required to differentiate the effect of Chhattisgarh's reforms from broader regional or national patterns in PDS consumption. Border districts are a good comparison group because, as we show, the distribution of observable characteristics of households in these districts is nearly identical to that of Chhattisgarh in 1999-2000.

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We make several contributions to the scholarly literature on PDS reforms. First, we provide a large-sample estimate of the effect of Chhattisgarh's PDS reforms on PDS rice consumption. We find that from 1999-2000 to 2009-10, the fraction of households in Chhattisgarh consuming any PDS rice increased by .3 relative to border districts in states that did not undertake any PDS reforms. The number of calories of PDS rice consumed daily by households in Chhattisgarh increased by 900 relative to these border districts.

Second, we find that about one-third of Chhattisgarh's PDS rice consumption growth from 1999-2000 to 2009-10 took place before 2004, the year of the Raman Singh government's first major reform. In contrast, there was little change in PDS rice consumption in comparison regions or in the other, newly-formed states of Jharkhand and Uttarakhand prior to 2004. Moreover, more than 70% of Chhattisgarh's growth in PDS rice consumption from 1999-2000 to 2009-10 – relative to border districts in states that undertook no major PDS reforms – took place prior to 2004.

Third, we provide evidence that the increase in PDS rice consumption in Chhattisgarh prior to 2004 was likely aided by reforms undertaken by the Ajit Jogi government. Between 2000 and 2004, the number of FPSs in Chhattisgarh and the amount of PDS rice procured directly by the Chhattisgarh government nearly doubled, while neither changed substantially in states bordering Chhattisgarh.

Fourth, we find that subsequent to 2004, PDS rice consumption growth in Chhattisgarh was similar to comparison regions that undertook no major PDS reforms. The Raman Singh government's PDS reforms, which began in 2004, have been credited with much of Chhattisgarh's success (Puri 2012). However, we estimate that at most one-third of PDS consumption growth in Chhattisgarh after 2004 can be attributed to these reforms.

Fifth, we identify a temporary fall in PDS rice consumption of about one-third immediately after Chhattisgarh discontinued private FPS licences in 2004. This fall in PDS consumption is not shared by any of our comparison groups. This finding highlights the importance of ensuring the availability of rations during policy transitions.

Our findings do not imply that the PDS reforms of the Raman Singh government were ineffective. They do suggest that the factors we identify also contributed to PDS consumption growth in Chhattisgarh. These are important considerations

in assessing the likely impact of the NFSA's reforms, or similar reforms in other states.

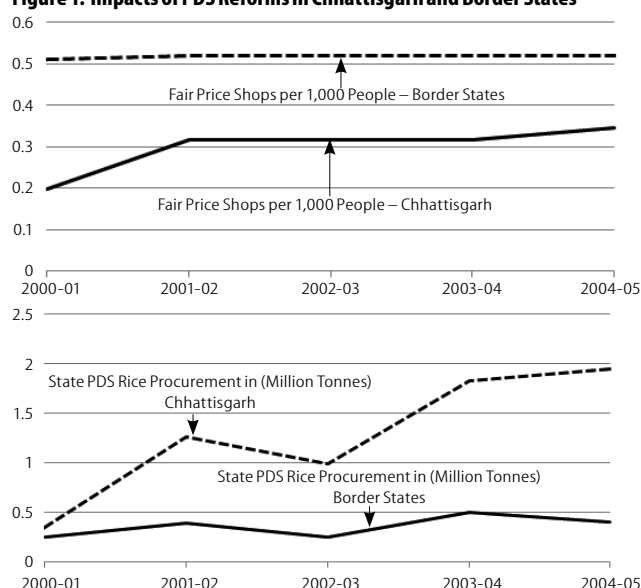
PDS Reforms in Chhattisgarh and Border States

Chhattisgarh instituted a number of PDS reforms between 1999-2000 and 2009-10, the years of our study. Table 1 presents a timeline of reforms. We divide these reforms into those instituted by the Ajit Jogi government from 2000-03, and those instituted by the Raman Singh government from 2004 onwards.

Reforms between 2000 and 2004

Under the Ajit Jogi government, Chhattisgarh undertook two major PDS reforms before 2004. First, Chhattisgarh allowed private dealers to apply for licences to run FPSs. Second, Chhattisgarh increased the amount of PDS rice that it procured directly from in-state farmers.

Figure 1: Impacts of PDS Reforms in Chhattisgarh and Border States



The top panel of the figure presents the number of fair price shops (FPSs) per 1,000 people in Chhattisgarh and states bordering Chhattisgarh; and the bottom panel presents the average amount of PDS rice procured by the state government in Chhattisgarh and states bordering Chhattisgarh.

Source: All figures are obtained from Annual Reports published by the Ministry of Consumer Affairs and from the report "Programme Evaluation of Targeted Public Distribution System", published by the Planning Commission in 2005. Data on the FPSs and state PDS rice procurement is not available at the district level from these sources. States that border Chhattisgarh are Andhra Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, and Uttar Pradesh.

Table 1: Timeline of Major PDS Reforms in Chhattisgarh during 2000-10

	Year	Reform	Description
Instituted by Ajit Jogi government (2000-03)	2001	Sarvajanik Nagrik Poorti Vitran Scheme	Allowed private participation in the distribution of PDS commodities.
	2002	Decentralised Procurement Scheme	Allowed the state government to procure rice directly from farmers.
Instituted by Raman Singh government (2004 onwards)	2004	Public Distribution System (Control) Order 2004	De-privatised FPSs and instituted a number of transparency/auditing mechanisms for foodgrain distribution. Passed in December 2004.
			De-privatisation implemented starting September 2005 after legal challenge.
	2007	List price reduction	Offered PDS foodgrain below the Central Issue Price.
	2007	Mukhyamantri Khadyann Sahayata Yojana Scheme	Increased the number of people entitled to the most preferential PDS subsidies.

This table summarises reforms to the PDS in Chhattisgarh between 2000 and 2009-10.² The top panel lists reforms instituted by the Ajit Jogi government; the bottom panel lists reforms instituted by the Raman Singh government. For reforms in border states, see Khara (2011a).

Source: PDS articles in *The Times of India* and *The Hindu* between 1998 and 2011.

The lack of access to FPSs is especially important in Chhattisgarh, because it is predominantly rural. The top panel of Figure 1 (p 75) shows that in 2000, the number of FPSs per 1,000 people in Chhattisgarh was less than half the number in border states. All FPSs in Chhattisgarh were operated by cooperatives at the time of its formation in 2000. According to the state government, these cooperatives were not in a financial position to extend their coverage (Patnaik 2005).

To improve FPS coverage, Chhattisgarh began to grant licences to own and operate FPSs to private parties under the Sarvajani Nagrik Poorti Vitran (SNPV) Scheme in June 2001. As a result of this reform, the number of FPSs in the state doubled between 2001 and 2004. By 2004, there were 8,637 total FPSs, of which 5,049 were privately owned.

Chhattisgarh also restructured its system of procurement for PDS rice. In 2002, Chhattisgarh began to participate in the decentralised procurement scheme (DCP), in which state governments procure rice and wheat directly from local farmers at the minimum support price (MSP), and are reimbursed by the central government. The bottom panel of Figure 1 demonstrates that from 2002-04, PDS rice procurement rose from just under one million metric tonnes to just under two million metric tonnes, an increase of approximately 100%.

To the best of our knowledge, states with districts that share a border with Chhattisgarh did not undertake comparably comprehensive PDS reforms between 1999 and 2004.³ Comparative studies of PDS diversion that include this time period do not list reforms in these states (Khera 2011a, 2011b). Consistent with this lack of reforms, Figure 1 shows that there was no noticeable change in FPS coverage in states that border Chhattisgarh, and that there was little change in PDS rice procured by governments in these states.⁴

Reforms between 2004 and 2010

Following the Raman Singh government's ascendance to power in December 2003, the reform process in Chhattisgarh continued. The Raman Singh government passed its first major PDS legislation – the 2004 Public Distribution System (Control) Order – in December 2004. The Order discontinued the operation of FPSs by private dealers everywhere in the state, and permitted their operation only by Gram Panchayats, cooperative societies, self-help groups, and forest protection committees. This part of the Order provoked a legal challenge and was not implemented until the resolution of a Supreme Court case in September 2005 (Patnaik 2005).

The PDS (Control) Order contained a number of other reform provisions: delivery to FPSs should take place by the first week of the month, allocation of grains to FPSs should be disclosed to gram panchayats and other local bodies, and inspections and social audits should take place within specified intervals. The government subsequently introduced measures to increase the financial viability of FPSs by providing an interest-free loan of Rs 75,000 for each FPS, and increasing the commission on items sold from Rs 8 to Rs 45 per quintal.

Under the Raman Singh government, Chhattisgarh also increased the coverage of the PDS through the Mukhyamantri

Khadyann Sahayata Yojana (MKS) scheme. Launched in April 2007, this scheme provided BPL rations to households that were BPL in the 1991 or 1997 BPL surveys, but were not BPL in the 2002 survey. This scheme increased the number of individuals eligible for the largest PDS subsidies by nearly two million (Puri 2012). Chhattisgarh also reduced PDS prices below the central issue price in 2007 (Dreze and Khera 2010).

Chhattisgarh implemented a number of smaller reforms after 2004, including sending “SMS alerts” to report grain movements to citizens who registered to receive them; using electronic weighing machines for rations; visibly marking households to indicate their ration entitlement; and publicly displaying a list of all ration card holders at the FPS.⁵

Unlike the pre-2004 period, a number of states bordering Chhattisgarh began to implement similar PDS reforms between 2004 and 2009-10. During this period, Andhra Pradesh, Madhya Pradesh and Odisha reduced the price of PDS commodities below the central issue price (see, for example, Khera 2011a).⁶ Khera (2011a) also provides a more complete description of reforms in other states.

Data and Estimation

We utilise data from the 55th (1999-2000), 61st (2004-05), and 66th (2009-10) rounds of the Consumer Expenditure Survey conducted by the National Sample Survey Office (NSSO). Each survey records a household's consumption of rice obtained from the PDS over the previous 30 days. We calculate two different measures of PDS rice consumption: “PDS Rice Utilisation” is the share of households reporting any PDS rice consumption; “PDS Rice Calories” is the total PDS rice calories consumed per household per day.⁷ We analyse PDS rice consumption changes in Chhattisgarh over two separate periods: 1999-2000 to 2004-05, and 2004-05 to 2009-2010. Rice is the staple foodgrain in the region, and other studies have found that PDS rice consumption is a better proxy for overall PDS consumption (Puri 2012).⁸

Our estimation strategy compares changes in PDS rice consumption in Chhattisgarh with changes in border districts, border states, and the rest of India. This helps to rule out the possibility that the changes we observe in Chhattisgarh are

Table 2: Number of Households Sampled by Comparison Region

	Chhattisgarh	Border Districts ^a	Border Districts (No Reforms ^b)	Border States ^c	Rest of India ^d
1999-2000 (55th round)	2,292	3,316	898	47,340	1,13,711
2004-05 (61st round)	2,796	3,994	1,186	49,016	1,16,939
2009-10 (66th round)	2,232	3,295	832	39,365	95,328

The observations for Chhattisgarh in the 55th round represent the number of observations in the districts that would later become Chhattisgarh.

(a) The districts that border Chhattisgarh are as follows. From Andhra Pradesh: Karimnagar, Khammam, Warangal; from Jharkhand – Garhwa, Gumla, Simdega. From Madhya Pradesh: Anuppur, Balaghat, Dindori, Shahdol, Sidhi, Singrauli. From Maharashtra: Bhandara, Chandrapur. From Odisha: Bargarh, Jharsuguda, Kalahandi, Koraput, Malkangiri, Nabarangpur, Naupada, Sundargarh. From Uttar Pradesh: Sonbhadra.

(b) The districts exclude data from Andhra Pradesh, Madhya Pradesh and Odisha.

(c) Border states include Andhra Pradesh, Jharkhand, Maharashtra, Madhya Pradesh, Odisha and Uttar Pradesh.

(d) The rest of India includes all households from the NSSO surveys that do not reside in Chhattisgarh, or in districts bordering Chhattisgarh.

Source: Consumer Expenditure Surveys conducted by the National Sample Survey Organisation in 1999-2000 (55th round), 2004-05 (61st round), and 2009-10 (66th round).

due to common, regional, or national patterns. We also utilise border districts in states that did not implement any major PDS reforms from 1999-2000 to 2009-10 (Khera 2011a).⁹ The choice of border districts as a comparison region assumes that absent the reforms, the forces driving PDS rice consumption are similar across state boundaries. Table 2 (p 76) summarises the number of households by comparison region in each survey.

Table 3: Household Characteristics in Chhattisgarh and Border Districts Prior to the PDS Reforms

	Chhattisgarh 1999-2000 (1)	Border Districts 1999-2000 (2)	Diff: C(1) – C(2) (3)
Share of grains in overall calories	0.757(0.003)	0.747(0.002)	0.011(0.013)
Ln (number of meals consumed out of home)	0.591(0.028)	0.598(0.022)	-0.006(0.118)
Ln (monthly per capita expenditure)	6.12(0.012)	6.12(0.011)	0.002(0.067)
Share of households consuming other PDS commodities (kerosene or sugar)	0.799(0.008)	0.744(0.008)	0.055(0.037)
Share of households that are self-employed	0.147(0.007)	0.152(0.006)	-0.005(0.013)
Share of households that are rural	0.707(0.010)	0.701(0.008)	0.006(0.053)
Share of households that belong to a scheduled caste	0.139(0.007)	0.154(0.006)	-0.015(0.027)
Share of households that belong to a scheduled tribe	0.263(0.009)	0.274(0.008)	-0.010(0.074)
Share of households that are Hindu, Buddhist, Sikh, or Jain	0.955(0.004)	0.935(0.004)	0.019(0.015)
Share of households that are Muslim	0.028(0.003)	0.032(0.003)	-0.004(0.009)
Share of households that are Christian	0.017(0.003)	0.033(0.003)	-0.016(0.016)
Observations	2292	3316	-

This table reports summary statistics of household characteristics in the 1999-2000 NSSO Consumer Expenditure Survey, which are used as control variables in the extended empirical analysis. Column (1) reports average characteristics in Chhattisgarh; column (2) reports average characteristics in border districts; and column (3) reports the difference between the two regions. Standard errors clustered by district are presented in parentheses.

Source: Consumer Expenditure Survey conducted by the NSSO in 1999-2000 (55th round).

In the main text, we present our analysis in terms of simple means. None of the findings we present qualitatively changes when we condition our estimates on household characteristics available in the NSSO survey and district fixed effects. Household characteristics include monthly per capita expenditure, urban/rural location, meals consumed outside the household, self-employment, whether a household receives any public benefit besides PDS foodgrain, religion, and caste (scheduled caste, scheduled tribe, or Other Backward Class). We discuss estimation issues that arise from stratified sampling in the NSSO surveys, omitted household determinants of PDS consumption, and heterogeneity in the effect of PDS reforms on households in the methodology section contained in the Appendix (p 81). Table 3 demonstrates that in 1999-2000, households in Chhattisgarh and in border districts were virtually identical across each of these household characteristics. Table 3 provides strong evidence for our research design.

PDS Rice Consumption in Chhattisgarh

Households in Chhattisgarh increased their consumption of PDS rice dramatically between 1999-2000 and 2009-10. This increase is substantial relative to border districts, border states, and the rest of India. Columns (1), (3) and (4) of Table 4 illustrate these changes.

Three features of the data stand out.¹⁰ First, in 1999-2000, PDS Rice Utilisation (.100) and PDS Rice Calories (153.7) in districts that later became Chhattisgarh were far lower than in any comparison region.¹¹ This is despite the fact that households in Chhattisgarh are nearly identical to those in border districts along all observable characteristics in Table 3. Second,

both PDS Rice Utilisation and PDS Rice Calories increased substantially in Chhattisgarh over this time period. From 1999-2000 to 2009-10, PDS Rice Utilisation increased from .10 to .33, and PDS Rice Calories rose by about 1,200. By 2009-10, Chhattisgarh had caught up with border districts and overtaken the rest of India.

Third, these changes in Chhattisgarh are much larger than the changes in all comparison regions over this same period. PDS Rice Utilisation increased by .289 more in Chhattisgarh than in border districts (.33 less .041) that undertook no major PDS reforms over this period. PDS Rice Calories rose by 899.3 more in Chhattisgarh than in the same border districts (1,352.2 less 452.9). These patterns do not change when comparing the growth in Chhattisgarh to the other comparison regions.

These figures are consistent with the explanation that the overall reform process in Chhattisgarh had a large and positive effect on PDS rice consumption. Although we cannot separate PDS rice consumption by district prior to 1999, we find no difference in the growth of PDS rice consumption for households in Madhya Pradesh – out of which Chhattisgarh was formed – relative to

Table 4: PDS Rice Utilisation and Calories

	1999-2000 (1)	2004 (2)	2009-10 (3)	Diff 1: C(3)-C(1) (4)	Diff 2: C(2)-C(1) (5)	Diff 1: C(3)-C(2) (6)
PDS Rice Utilisation:						
Chhattisgarh	.100 (.006)	.194 (.046)	.430 (.028)	.330*** (.025)	.094 (.057)	.236*** (.057)
Border districts (no reforms)	.255 (.015)	.089 (.012)	.300 (.016)	.041 (.034)	-.166*** (.045)	.207*** (.027)
Border districts	.342 (.008)	.251 (.010)	.466 (.048)	.124*** (.031)	-.091*** (.031)	.216*** (.026)
Border states	.223 (.016)	.183 (.016)	.311 (.018)	.088*** (.012)	-.040*** (.011)	.123*** (.010)
Rest of India	.275 (.014)	.202 (.012)	.316 (.016)	.041*** (.001)	-.073*** (.008)	.114*** (.008)
PDS Rice Cal:						
Chhattisgarh	153.7 (14.7)	772.4 (51.1)	1,505.9 (87.4)	1,352.2*** (77.9)	618.7*** (40.9)	733.5*** (175.7)
Border districts (no reforms)	172.9 (19.7)	160.1 (25.6)	625.9 (36.6)	452.9*** (104.2)	-12.8 (52.5)	465.8*** (59.6)
Border districts	519.6 (90.7)	511.6 (22.1)	1,023.5 (103.7)	503.9*** (70.7)	7.99 (68.8)	511.9*** (91.0)
Border states	307.8 (30.5)	347.6 (33.1)	630.1 (44.1)	322.3*** (36.4)	39.8* (23.8)	285.4*** (30.2)
Rest of India	579.5 (56.2)	487.4 (42.2)	709.0 (53.6)	129.5*** (43.4)	-92.1*** (31.6)	221.6*** (29.0)

Column (2) reports households surveyed in 2004 from the 61st round. Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, with ***/**/* denoting statistical significance at the 1%/5%/10% level.

Source: The 55th, 61st, and 66th rounds of the Consumer Expenditure Surveys conducted by the NSSO.

households in border states from 1993-94 to 1999-2000.¹² Since PDS rice consumption also grew in Chhattisgarh relative to border districts (excluding Madhya Pradesh) from 1999-2000 to 2009-10, it is unlikely that our results are an artifact of differing prior trends across Chhattisgarh and border regions.

Decomposing PDS Consumption Growth

This broad increase in PDS rice consumption in Chhattisgarh masks two important patterns in the data. First, the increase in PDS rice consumption in Chhattisgarh, in both absolute and relative terms, began prior to the Raman Singh government's major reforms. These reforms in particular have been credited with improving PDS access in Chhattisgarh (Puri 2012). Column (2) of Table 4 presents the average PDS consumption for the 1,394 households in Chhattisgarh surveyed in 2004 – prior to these reforms – as part of the 61st round.^{13, 14} From 1999-2000 to 2004, PDS Rice Utilisation in Chhattisgarh increased by .094 (a 94% increase), and PDS Rice Calories increased by 618.7 (an over 500% increase).¹⁵ These represent 28% and 46%, respectively, of the total increase in PDS Rice Utilisation and PDS Rice Calories in Chhattisgarh from 1999-2000 to 2009-10.

The increase in Chhattisgarh is ever larger relative to the change in PDS rice consumption in all comparison regions. From 1999-2000 to 2004, PDS Rice Utilisation actually fell in all comparison regions, and PDS Rice Calories were roughly constant.¹⁶ As a result, relative to border districts in states that undertook no major reforms, about 90% of the increase in PDS Rice Utilisation (.260/.289) and about 70% of the increase in PDS Rice Calories (631.5/899.3) in Chhattisgarh from 1999-2000 to 2009-10 took place before 2004.

Second, after the reforms of 2004, the increase in PDS rice consumption in Chhattisgarh is not substantially different from the increase in comparison regions. PDS Rice Utilisation in Chhattisgarh rose from .194 to .430 from 2004 to 2009-10, but it increased from .089 to .300 in border districts that undertook no major PDS reforms over the same time period. The increase in Chhattisgarh is not statistically different from the contemporaneous increase in these border districts.¹⁷ A similar pattern holds for PDS Rice Calories. The increase in Chhattisgarh from 2004 to 2009-10 (733.5) is larger in magnitude than the increase in border districts that undertook no major PDS reforms (465.8). As a result, the raw increase in Chhattisgarh (733.5) substantially overstates the effect attributable to the post-2004 reforms. At most 36% of the increase in PDS Rice Calories in Chhattisgarh over this period can be attributed to the Raman Singh government's post-2004 reforms.

A common pattern of PDS growth in Chhattisgarh and border districts after 2004 suggests the presence of regional forces that were distinct from Chhattisgarh's particular reforms. For example, the states of Andhra Pradesh, Madhya Pradesh and Odisha implemented reforms that decreased the price of PDS foodgrains between 2004-05 and 2009-10 (Khera 2011a). Column (6) of Table 4 shows that the growth in PDS rice consumption of households in border districts from these states and households in border districts of states that did not implement reforms (Jharkhand, Maharashtra and Uttar Pradesh)

were nearly identical. It is also likely that the rise in the market price of rice across the entire country and the global financial crisis were responsible for part of the common increase in PDS rice consumption from 2004 to 2010.

The pre-existing upward trend in Chhattisgarh suggests that the pre-2004 reforms and other social and political factors continued to play a role in the growth of PDS rice consumption after 2004. These factors would have operated in conjunction with changes to the PDS from 2004 to 2009-10. In their absence, it is possible that Chhattisgarh would not have witnessed such a large increase in PDS consumption. Taken together, these findings present a cautionary tale for the NFSA, and for states seeking to duplicate Chhattisgarh's success by adopting similar reforms.

A Second Look at PDS Rice Consumption Prior to 2004

We have suggested that the increase in PDS rice consumption in Chhattisgarh prior to 2004 was a result of the expansion of PDSs and state-level procurement. Given the available data, it is difficult to precisely identify the forces behind this increase. Nevertheless, we are able to test two plausible alternative hypotheses. First, the PDS could be easier to operate in a smaller and newer state. For example, transaction costs and monitoring costs might be lower in a smaller state. There may be fewer entrenched interests to resist policy changes. We test this hypothesis by examining PDS rice consumption in two new states – Jharkhand and Uttarakhand – from 1999-2000 to 2004 (Table 5). We find no comparable growth in Jharkhand or Uttarakhand in either PDS Rice Utilisation or in PDS Rice Calories. This finding does not change if we examine PDS consumption growth in each state relative to districts that border the state. We conclude that the formation of a new state is an unlikely explanation for PDS rice consumption growth in Chhattisgarh over this period.

Table 5: PDS Consumption in Newly Formed States

	1999-2000 (1)	2004 (2)	Diff: C(2)–C(1) (3)	Obs (4)
PDS Rice Utilisation:				
Chhattisgarh	.100(.013)	.194(.046)	.094(.057)	3,685
Jharkhand	.066(.014)	.019(.003)	-.047***(.013)	4,586
Uttarakhand	.312(.081)	.170(.01)	-.142*(.055)	1,877
PDS Rice Cal:				
Chhattisgarh	153.7(14.7)	772.4(135.9)	618.7*** (40.9)	3,685
Jharkhand	52.8(11.5)	35.1(6.96)	-17.7(11.9)	4,586
Uttarakhand	770.7(240.6)	477.2(37.2)	-293.5(175.4)	1,877

Column (2) reports households surveyed in 2004 from the 61st round. Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, with ***/**/* denoting statistical significance at the 1%/5%/10% level. Source: The 55th and 61st rounds of the Consumer Expenditure Surveys conducted by the NSSO.

Second, some of the increase in PDS rice consumption in Chhattisgarh from 1999-2000 (55th round) to 2004 (61st round) could have been caused by other actions taken by the Raman Singh government. The Raman Singh government, which took power in December 2003, identified improving the PDS as a policy priority. This focus on the PDS might have improved the operation of the existing system during 2004, even before the passage of reforms. For example, some of the reforms formalised in the PDS (Control) Order 2004 were

tested as pilot programmes prior to the promulgation of the Order in December 2004.¹⁸ Dreze and Khera (2010) suggest that,

Ultimately...it is political will that seems to matter most. Somehow, the PDS became a political priority in Chhattisgarh and a decision was made to turn it around. When political bosses firmly direct the bureaucracy to fix a dysfunctional system, things begin to change (p 1).

We further investigate the timing of PDS consumption growth in Chhattisgarh to determine whether this explanation might account for the pre-2004 growth. Specifically, we present estimates of PDS consumption growth from all NSSO “thin rounds” in our possession between 1999-2000 and 2004-05 in Table 6. These comprise the 2000-01 survey (56th round) and the 2003 survey (59th round). The two surveys differ from the “thick rounds” in terms of how they stratify households by income and by rural/urban status. This makes it difficult to interpret simple differences in averages between the two types of rounds. However, comparing the changes between the two types of surveys in Chhattisgarh to changes in comparison regions helps to limit this concern. Our results are similar when we compare PDS rice consumption by rural/urban and income strata separately, and when we condition on household characteristics.¹⁹

The results presented in Table 6 suggest that PDS rice consumption grew in Chhattisgarh relative to all comparison

Table 6: PDS Consumption between Thick Rounds

	1999-2000 (1)	2000-01 (2)	2003 (3)	Diff 1: C(2)–C(1) (4)	Diff 2: C(3)–C(1) (5)
PDS Rice Utilisation:					
Chhattisgarh	.100 (.006)	.152 (.018)	.087 (.013)	.052* (.020)	-.013 (.022)
Border districts	.342 (.008)	.230 (.031)	.159 (.028)	-.112*** (.023)	-.183*** (.030)
Border states	.223 (.016)	.123 (.015)	.113 (.012)	-.100*** (.010)	-.110*** (.009)
Rest of India	.275 (.014)	.147 (.011)	.114 (.010)	-.128*** (.008)	-.161*** (.010)
PDS Rice Cal:					
Chhattisgarh	153.7 (14.7)	330.2 (51.7)	447.3 (109.4)	176.5*** (52.0)	293.6** (103.6)
Border districts	519.6 (90.7)	388.4 (61.6)	347.9 (56.3)	-131.2** (49.5)	-171.7** (66.0)
Border states	307.8 (30.5)	200.3 (27.3)	296.1 (78.1)	-107.5*** (17.9)	-11.7 (76.8)
Rest of India	579.5 (56.2)	305.9 (33.2)	337.4 (50.1)	-274.5*** (34.3)	-242.9*** (46.1)

Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, with ***/**/* denoting statistical significance at the 1%/5%/10% level.

Source: The 55th, 56th, and 59th rounds of the Consumer Expenditure Surveys conducted by the NSSO.

regions prior to the election of the Raman Singh government. There was an absolute increase in PDS Rice Calories in Chhattisgarh between 1999-2000 and 2000-01, and between 1999-2000 and 2003. This increase contrasts with the decrease in PDS rice calories consumed in each comparison region over both time periods. Although the magnitude of the decrease in comparison regions is likely a result of sampling differences between the surveys, the difference with respect to Chhattisgarh is still instructive.²⁰ PDS Rice Utilisation remained roughly constant

across each time period in Chhattisgarh. However, this lack of change is again in contrast to the large decreases in each comparison region between each time period.

Disruptions to PDS Access during the Reforms

Finally, we provide evidence that the PDS (Control) Order of 2004 may have temporarily disrupted PDS availability in Chhattisgarh. The Order discontinued the FPS licences of private dealers and provided a short timeline for the transfer of ownership to

Table 7: PDS Consumption Immediately before and after the 2004 PDS Reform

	2004 (1)	2005 (2)	Diff: C(2)–C(1) (3)
PDS Rice Utilisation:			
Chhattisgarh	.194(.046)	.148(.031)	-.046*(.022)
Border districts	.251(.010)	.262(.040)	.011(.021)
Border states	.183(.016)	.188(.016)	.005(.005)
Rest of India	.202(.012)	.215(.014)	.013***(.004)
PDS Rice Cal:			
Chhattisgarh	772.4(51.1)	508.4(100.3)	-264.0*** (60.8)
Border districts	511.6(22.1)	534.3(79.9)	22.7(56.3)
Border states	347.6(33.1)	344.8(31.0)	-2.87(12.3)
Rest of India	487.4(42.2)	530.6(49.5)	43.2** (16.6)

Columns (1) and (2) report households surveyed in 2004 and those surveyed in 2005, respectively, from the 61st round. Standard errors clustered by district are presented in parentheses. Statistical significance is reported for the differences, with ***/**/* denoting statistical significance at the 1%/5%/10% level.

Source: The 61st round of the Consumer Expenditure Survey conducted by the NSSO.

gram panchayats or other local groups. However, the Order could not be implemented until the resolution of a Supreme Court case in 2005 (Patnaik 2005). During this time period, private dealers may have exited the market, resulting in a temporary disruption of PDS access to households in Chhattisgarh.

We investigate this concern by utilising the 2004-05 Consumer Expenditure Survey conducted by the NSSO. The first half of the survey was conducted prior to the PDS (Control) Order, while the second half was conducted immediately after the Order, but before the transfer of FPSs to local groups could take place. The results in Table 7 are consistent with a temporary disruption in the availability of PDS rice immediately after the reform. PDS Rice Utilisation fell by .046 and PDS Rice Calories fell by 264. In contrast, these figures were roughly constant in all comparison regions.

Although PDS consumption more than rebounded in Chhattisgarh by 2009-10, this short-term pattern is consistent with difficulties in implementing the PDS reforms. If even Chhattisgarh, which had the political will to initiate and implement reforms on its own, experienced a short-run fall in PDS consumption in this process, then we might expect this fall to be of greater size and duration in states that lack such will, but adopt similar reforms. These findings suggest that states reforming their distribution of PDS foodgrain should pay particular attention to securing the availability of rations during the transition period.

Conclusions

Several important patterns emerge from this study of PDS consumption growth in Chhattisgarh and comparison regions, all of which have implications for current reform efforts. First, PDS rice consumption by households in Chhattisgarh grew substantially from 1999-2000 to 2009-10, relative to districts

bordering Chhattisgarh in states that undertook no comparable PDS reforms. Excluding PDS rice consumption, the observable characteristics of households in these districts are nearly identical – both economically and statistically – to those in Chhattisgarh in 1999-2000. This finding suggests that comprehensive and sustained reforms, when coupled with political will and civil society effort, can improve PDS access. The increase in PDS rice consumption in Chhattisgarh also provides an opportunity to analyse further the effects of in-kind food aid on food insecurity and malnutrition (Krishnamurthy et al 2013).²¹

Second, about 40% of the increase in PDS rice consumption in Chhattisgarh from 1999-2000 to 2009-10 took place before the major reforms of the Raman Singh government began in 2004. This magnitude is even larger when viewed in comparison to border districts, which experienced little change in PDS rice consumption between 1999-2000 and 2004. The increase in Chhattisgarh is not shared by smaller, newly-formed states such as Jharkhand and Uttarakhand. Neither can it be explained by unobserved administrative actions taken by the Singh-led government after coming to power in late 2003. We suggest that the expansion of FPSs and state procurement of PDS rice by the Ajit Jogi government may have contributed to this growth.

Third, while PDS rice consumption grew in Chhattisgarh after 2004 (Khera 2011a, 2011b; Puri 2012), it grew by a similar amount in districts that border Chhattisgarh in states that undertook no major PDS reforms. At most one-third of the PDS

consumption growth in Chhattisgarh after 2004 can be attributed to the Raman Singh government's major reforms. This finding does not imply that these reforms had no effect, but it underlines the difficulty of distinguishing this effect from broader trends, previous reforms, and the political and social will to improve the PDS.

Fourth, there was a temporary fall in PDS rice consumption in Chhattisgarh of about one-third immediately following the 2004 PDS (Control) Order, which discontinued private FPS licences. In contrast, there was no comparable change in border districts, border states, or the rest of India over this time period. This finding suggests that policymakers contemplating analogous changes to PDS distribution should think carefully about the availability of PDS rations during the transition period.

These findings indicate that the increase in PDS consumption in Chhattisgarh was driven by multiple factors. The major reforms undertaken by the Raman Singh government starting in 2004 may have played a role, but so did earlier reforms by the Ajit Jogi government, diffuse political and social factors that were likely present prior to 2004, and post-2004 regional and national trends. These findings advise caution in extrapolating Chhattisgarh's experience to other reforms at the state or central level. Chhattisgarh's experience provides some empirical support for the claim that the NFSA can increase PDS consumption, but it also implies that such increases might not be substantial or sustained in the absence of comparable political and social effort.

NOTES

- 1 Due to the attention they have received in academic and policy discussions, we refer to these provisions as the "major reforms" of the Raman Singh government.
- 2 Chhattisgarh began to implement the Antyodaya Anna Yojana (AAY) scheme in 2001. The AAY scheme required states to identify the poorest of BPL households and supply them with AAY cards entitling them to a larger ration at a lower price. This quantity started at 25 kg rice at Rs 3 per kg in 2000, and was raised to 35 kg in 2002. However, AAY families only constitute 3% of our sample in Chhattisgarh and border districts for years in which ration-card ownership is available. Therefore, our results are not an artefact of early AAY implementation in Chhattisgarh.
- 3 A search of news stories in *The Times of India* and *The Hindu* from 1998-2005 revealed no evidence of large-scale reforms in neighbouring states.
- 4 The Annual Report of the Ministry of Consumer Affairs, Food, and Public Distribution reports very little change in PDS rice procured by the FCI from either Chhattisgarh or any border state during this time period.
- 5 Chhattisgarh's PDS reforms continue to evolve. Chhattisgarh recently passed the 2012 Food Security Act, which further expands PDS eligibility and increases the level of rations.
- 6 In Andhra Pradesh and Madhya Pradesh, the quantity of the ration was reduced to help offset the additional cost. Jharkhand also reduced the price of PDS commodities below the central issue price, but did so after the time period under analysis.
- 7 We calculate the calories consumed from PDS foodgrains by multiplying total kilograms

consumed by the average calories per kilogram in the *Nutritive Values of Indian Foods* (Gopalan et al 1989).

- 8 Estimates for PDS wheat utilisation and wheat calories are available from the authors on request. These estimates are smaller in magnitude than those for rice, but convey a similar pattern.

- 9 These results are robust to the use of other comparison regions. In particular, the results are robust to using Madhya Pradesh as the comparison region.

- 10 The mean differences discussed below continue to be economically and statistically significant when we condition on household characteristics

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available in the NSSO survey, and district fixed effects. These results are available from the authors upon request.

- 11 Each of these differences is statistically significant at the 1% level. Although we do not report the associated standard error of the difference-in-differences estimates comparing the increases in PDS consumption in Chhattisgarh to comparison regions, all differences highlighted in the main text are either statistically significant, or at least border on conventional levels, in these simple estimates. They are all statistically significant in more complete specifications. These results are available from the authors upon request.
- 12 These results are available from the authors upon request.
- 13 The survey was conducted between June 2004 and June 2005. The survey sample was nearly identical in each time period. It included nearly identical numbers of households from each income and sector strata in each district in both 2004 and 2005. This was likely done to avoid seasonality effects in sampling.
- 14 When using the entire sample of the 2004-05 survey, there is still a large increase in PDS rice consumption relative to 1999-2000.
- 15 Although the change in the share of households consuming any PDS rice only borders conventional levels of statistical significance, the estimate becomes much more precise when adding control variables and fixed effects to help absorb omitted factors.
- 16 Both the growth in the share of households consuming PDS rice and growth in the number of calories obtained from PDS rice in Chhattisgarh are statistically different from the growth in border districts and the rest of India at the 1% level.
- 17 The increase in Chhattisgarh is not statistically different from the increase in border districts, even when we condition on household characteristics and district fixed effects.

Appendix: Methodological Issues

There are a number of issues that arise as a result of data limitations and our empirical strategy. First, we rely on surveys of actual PDS consumption, rather than purchases. This poses an issue if households over- or under-report, or change their actual usage of PDS rice in a way that is systematically associated with the timing of reforms in Chhattisgarh. However, there is no compelling explanation for why these factors would change only in Chhattisgarh, and not in bordering districts. Moreover, all other studies using NSSO consumption data are forced to rely on similar measures (Deaton and Dreze 2009; NSSO 2007).

Second, although our units of treatment are districts, we do not have access to a random sample of households within each district. The NSSO consumer expenditure surveys are stratified by whether a household resides in a rural or urban area, and further stratified by relative affluence. We are therefore unable to construct population estimates of PDS rice consumption for districts that would later form the state of Chhattisgarh, or for border districts in any of the rounds.

- 18 For example, private licences to run PDS shops were rescinded in a few districts prior to the abolishment of private participation in the PDS (Control) Order 2004.
- 19 These results are available from the authors upon request.
- 20 Much of the decrease between the 1999-2000 survey and the "thin rounds" for border districts disappears when using the 2004-05 survey, which uses the same sampling methodology as the 1999-2000 survey.
- 21 We find that non-grains consumption significantly increases in Chhattisgarh relative to comparison regions as the availability of PDS rice expands (Krishnamurthy et al 2013). These results contrast with previous estimates, which suggest that food price subsidies do not necessarily affect nutritional outcomes (Jensen and Miller 2011; Kochar 2005; Tarozzi 2005).

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This limitation does not invalidate our research design because our goal is to detect changes in PDS rice consumption over time. What matters for the comparison of unconditional means – the simplest difference-in-differences estimator – are changes in the sampling procedure over time. For the 55th round, the relative size of the rural/urban sample was determined by the share of the population that was rural in the 1991 Census. For the 61st and 66th rounds, it was determined by the 2001 Census. Therefore, differential trends in the growth of urban areas could drive differences in average PDS consumption across a pooled sample of rural and urban households. The stratification on relative affluence is also slightly different between the 55th round, and the other two rounds.

These differences in sampling, however, do not present a problem for our research design because they are based on characteristics that are observable in our data. By conditioning on these characteristics, we are able to estimate an average change in PDS rice consumption in Chhattisgarh, relative to comparison regions. All results presented above are qualitatively

identical in these more complete specifications (these results are available from the authors upon request). Moreover, all results are qualitatively identical when we restrict the sample to rural areas, urban areas, or any second-stage strata within which there is random sampling of households (that is, non-affluent/affluent households in rural/urban areas). For simplicity, we present means for the pooled sample (these results are available from the authors upon request).

Third, we estimate PDS rice consumption separately for households surveyed in 2004 and 2005 as part of the 61st round. The survey was conducted between June 2004 and June 2005, and the sample was nearly identical in each time period, probably to avoid seasonality effects in sampling. It surveyed nearly identical numbers of households from each income and sector strata in each district in both 2004 and 2005. This fact, along with the difference-in-differences design that evaluates changes in Chhattisgarh relative to comparison regions, limit concerns that our results are confounded by sampling issues.